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Endogenous Fantasy – Based Serious Games: Intrinsic Motivation and Learning

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***Abstract*—**Current technological advances pale in comparison to the changes in social behaviors and 'sense of place' that is being empowered since the Internet made it on the scene. Today's students view the Internet as both a source of entertainment and an educational tool. The development of virtual environments is a conceptual framework that needs to be addressed by educators and it is important that they become familiar with who these virtual learners are and how they are motivated to learn. Massively multiplayer online role playing games (MMORPGs), if well designed, could become the vehicle of choice to deliver learning content. We suggest that these games, in order to accomplish these goals, must begin with well-established instructional design principles that are co-aligned with established principles of video game design. And have the opportunity to provide an instructional model of significant prescriptive power. The authors believe that game designers need to take advantage of the natural motivation player-learners have for playing games by developing them in such a way so as to promote, intrinsic motivation, content learning, transfer of knowledge, and naturalization.

***Keywords*—**serious games, endogenous fantasy, intrinsic motivation, online learning.

I. Introduction

THE connotation of the term 'distance learning' has changed significantly over the past half century. There was a time that it referred to the fact that students had to travel a long distance (usually walking) to their school building in order to attend school. As technology advanced, the trend evolved from correspondence courses into online electronic delivery. Although the technological advances are certainly astounding, they pale in comparison to the changes in social behaviors and 'sense of place' that go well beyond what Joshua Meyrowitz alluded to in the book he wrote over two decades ago [1]. He stated his case well before the Internet or Web made it on the scene but the social change he described was prophetic. Meyoriwitz suggested that the electronic media of his time would create new social situations that would be shaped, not by physical location or in-person social encounters, but by the mediated milieu in which we live [1]. He predicted that these changes would democratize the use and acquisition of knowledge and understandings and would allow inhabitants in this mediated world to interact with each other in non-traditional ways, thereby blurring of age, gender, and knowledge authority distinctions.

Meyrowitz's comments on knowledge acquisition were mostly aimed at informal learning that would take place outside of the classroom through the ubiquitous use of television [1]. Now the Internet has supplemented and, in some cases, replaced television as a tool for accessing and acquiring information. Due to its ubiquity and because they are growing up with it, today's youth no longer make the distinction between formal versus informal learning and face-to-face versus distance education. In fact, the roles appear to have reversed. It may well be that to them the connotation of what is considered to be distance education is the traditional school building, reverting back to their grandfather's definition since technology creates an environment in which knowledge acquisition is at their fingertips.

Besides the blurring of age, gender, and sources of knowledge, it appears the distinctions that may have previously existed between formal and informal learning have become more unclear. Today's students view the Internet as both a source of entertainment and an educational tool. In a study sponsored by the Pew Internet & American Life Project, Levin and Arafeh described students' views on the Internet using various metaphors, such as a virtual "textbook", "tutor", "study group", "locker" and "backpack" [2]. Students today view the Internet as a significant resource for all types of living, playing, and learning, whose lines are often crossed. With the trend towards younger and younger use of electronics in their daily lives, this tendency is certainly going to continue [3].

The blurring between informal and formal education is being reflected in the exponential increase in the number of virtual schools since the turn of the century. As recently as 2005, more than 20 states had already established statewide, online learning programs that were producing double-digit increases in annual enrollments [4]. This is in addition to the 32 states that have initiated online learning programs in support of a variety of courses in all grade levels [5].

The development of virtual environments is a conceptual framework that needs to be addressed by educators and it is important that they become familiar with who these virtual learners are and how they are motivated to learn. Recent research on the attributes and preferences of successful distance learners include, among other things the desire for a self-managed, self-paced environment in which they are allowed to complete their assigned tasks in a manner and timetable of their own choosing [6]. This research has also shown that successful e-learners possess qualities similar to those who frequently play video games: they are independent, possess a thoughtful learning style, and are self-motivated by the ability to utilize interactive technology in new and

innovative ways.

II. MMORPGS AS A LEARNING TOOL

Playing massively multiplayer online role playing games (MMORPGs) is one of the fastest growing segments in the game industry [7]. Even the informal games sponsored by Yahoo and Pogo attract tens of millions of players worldwide. It should not be surprising that MMORPGs, if well designed, could become the vehicle of choice to deliver learning content. Like for their console-based counterparts, any effort to construct a game for education, regardless of an ease of access that is fostered by an ubiquitous delivery mode, must begin with well-established instructional design principles that are co-aligned with established principles of video game design. A failure to incorporate pedagogic goals in a serious game, regardless of how well constructed it is from a game design viewpoint, may result in a player base who has been entertained, but who does not learn the desired content. On the other hand, even if the game incorporates sound educational principles but is done so without the knowledge base and understanding of game design, probably will result in one that presents the educational materials correctly but fails to engage, motivate, and/or immerse its players, thereby stopping it from being produced by game development companies.

This close co-alignment of principles is easier said than done and presents an interesting set of challenges. First of all, most successful instructional designers clearly understand that the instructional plan needs to, among other things, first identify appropriate instructional methods for delivering the educational payload [8]. After analyzing the educational needs, learners, and the environment, that designer may decide that a video game may not be appropriate for the curriculum-specific instruction being developed. This thinking process can result in a disagreement and/or disconnect between the instructional technologists and game designers assigned to the development team. For their part, game designers generally hold that a well-designed game always teaches something [9] [10]. Further, the hierarchical techniques used to create game level design, and appearing to loosely parallel best educational practices can mislead game designers into falsely believing that their games are already intrinsically and educationally sound. It is imperative that the design teams identify those core elements and mechanics that are common both to video games and instructional designers that are also motivating and engaging to players. This is made difficult by the fact that much confounding of terminology exists between game developers and educational technologists. The core ideals of immersion and engagement are a prime example. It is exceedingly difficult to create an understanding between game designers and instructional technologists of the connotations associated with these two terms in their respective domains. To a game designer, they are linked hierarchically, with immersion being the highest level. The term ‘level’ refers to both the player’s state and that of the content itself. To an educator, it is hard to describe how one may be engaged in an activity without also being immersed. This is one of many examples that exist between the two parties and can cause the game to fail to support extended and tightly integrated cognitive activities that transform the simple acquisition of facts and figures into implicit understanding, analysis, synthesis, and evaluation needed for a player-learner to internalize the desired academic content [10].

In spite of these difficulties, the authors believe it is quite possible to develop games that are appropriate, entertaining, and valid in both informal and formal educational settings. They also believe that well-developed games (especially multi-player games) can be ideally suited for the e-learning environment. The key is to match the aforementioned attributes of player-learners with those theoretical principles that are shown to be most effective and appropriate for this specific learning situation and with the generally accepted game design and development practices. The result should be a design model of significant prescriptive power.

III. CHOOSING APPROPRIATE THEORETICAL BASES

A. Motivation and relevance

Successful instructional designers implicitly know that their designs need to be based on those theoretical bases that can be most easily translated into best practices that are appropriate for the chosen content, methodologies, and situations [11]. While it is generally incorrect to assume that all learners (even player-learners) are always ready to learn and/or are motivated in the same ways, it should be safe to assume that online player-learners need to be viewed differently than those found in face-to-face classrooms. In some cases, the personality/motivational characteristics can vary within the same person, depending on the type of class he or she is enrolled in. The same learner may be a reluctant learner in a face-to-face class but be highly motivated in an online situation [6].

The idea of basing instruction on sound motivational precepts is not new or unique to game design. Keller’s ideas on motivation are over twenty-five years old and are based on a synthesis of existing research on psychological incentives that was popular at the time [12]. The ARCS model relies on four foundational categories that are applied to the design of instructional activities and represent the concepts of Attention, Relevance, Confidence/Challenge, and Satisfaction/Success. Keller intended that his model be incorporated in accordance with other established historical instructional models, such as Gagne's Events of Instruction [13]. Keller and Gagne were colleagues and worked in conjunction with one another in developing a set of instructional role models. Keller’s model has been successfully applied to distance learning and games and has been shown to correlate strongly with generally accepted game design principles [14][15][10].

B. Hierarchical knowledge acquisition

In designing a successful online game, it is important to revisit how player-learners view the concept of knowledge acquisition. One downside to the ease of access and ubiquity of information is that these students now tend to look at knowledge as a consumable item rather than an asset that can be obtained ‘just in time’ when it is needed from the Internet and other sources [10] [16] [17] [18]. This is reflective in the

popularity of learning aides (i.e., hints or cheats) in games. When developing a game it is important for the design team (hopefully made up of both game designers and instructional technologists) to understand that, if the game is to be successful educationally, it needs build the game's hinting system with the idea in mind that these hints that are offered integrate systematic recall of previous content knowledge. The content of any proposed hints require considerable forethought so that they introduce content, as theorized by Bloom and others, in a hierarchical manner so as to foster deeper cognitive processing [19] [20] [21] [22].

Bloom's hierarchical view of knowledge acquisition provides a useful architectural basis upon which to categorize and strategize the introduction of the content that is to be learned inside the game. Successful teachers and instructional designers characteristically develop lessons to answer questions with particular leveled knowledge in mind that should be paralleled when developing game content, questions, and levels of inquiry. Using a taxonomical design creates an appropriate paradigm for serious games that benefit from best practices in educational theory. The authors suggest that, while this principle is foundational to good instruction, serious game designers often overlook it because they believe their games already follow these assumptions. Gameplay design is based on a process of setting up a series of critical choice sets that reinforce the focus of the game and also communicates how to advance in the game. Those choices are learned by those who wish to advance to the next higher levels. We contend that, to create a successful, motivating, and educational game, the design team must target the content to be fully integrated into its interactivity and choice-setting in such a manner that learning and internalizing that content is required for the players to advance without sacrificing the game's ludological (i.e., entertainment-driven) roots.

C. Immersing content with the game's fantasy context

Studies have supported the idea that what makes games motivational is a proper fantasy context. Game designers understand that games involving strong and interesting fantasies are more compelling than those with less emotional constructs and is key to the player's immediate decision whether to play or not to play [23]. Making a game educational requires the proper integration of the information that is to be learned into that fantasy construct. Research has long supported the notion that the more intrinsically the learning content is coupled with the fantasy context of the game the more of the content will actually be remembered [24].

In the world of games, the terms *interaction*, *engagement*, and *immersion* are not synonymous, creating some bit of confusion between game and instructional designers. To a game designer, the concept of immersion relates both to the player and also to the game's fantasy context. With this in mind, Janet Murray defined immersion in interactive entertainment parlance as the both process of *suspending one's disbelief*, and actively creating a belief in the developing fantasy [25]. To translate this into academic vernacular, the concept of immersion relates more closely to what Jeff Wirth refers to as *an investment in the belief* in the content as a measure of its effectiveness [26]. Because the learner-player believes that the content is important to them (is relevant to them) because it is needed to solve a problem (i.e., move on to another level), he or she is ready and willing to invest in learning that content.

The issue at hand is that there has been little consensus to date on the process by which games effectively engage and motivate player-learners. Garris, Ahlers & Driskell describe the characteristics of a game in terms of six broad dimensions: fantasy, rules and goals, sensory stimuli, challenge, mystery and control [27]. Rieber added the concepts of intrinsic and exogenous motivation, which was later extended to the parse and better describe the nuances of the game's fantasy context [28] [29]. Based on this definition, an intrinsic (i.e., endogenous) fantasy-based educational game refers to one in which the learning of content is highly related to (i.e., highly immersed in) the game's narrative elements.

Researchers have successfully studied the positive effect highly integrated fantasy has had on learning and [30]. For example, a game may teach genetics by requiring the player-learner to manipulate a creature's genes to affect a proscribed change in that creature's offspring. In an extrinsic (i.e., exogenous) fantasy-based educational game the genetic concepts would be overlaid by the fantasy in a way in which the game designer could just as easily teach any subject without changing the fantasy storyline without creating a disruption to the flow of the game. In another example, player-learners may be asked to save a princess in distress by answering riddles based on the chemical structure of proteins and the required genetic material to code those proteins. The same game could be used for mathematics, language arts, or other subject matter. While games based on this type of exogenous fantasy or storyline are initially fun, the authors suggest that studies into and theories about cognitive load support the idea that the more immersed in the game's fantasy context the content becomes, the more motivated the player-learners will be to remain on task in order that they practice and reuse it thereby more deeply processing (i.e., learn) the material [31].

The theoretical basis for this line of thinking is that the emotional attachment to the game's fantasy will have a positive effect on reducing cognition and cognitive load [31]. While a properly devised fantasy is key to building initial emotional attraction and attachment to the game, fantasy alone is not powerful enough to keep a player-learner motivated and engaged long enough for learning to take place [32]. According to Cognitive Load Theory, knowledge is acquired in terms of working memory that is differentiated among intrinsic, extraneous, and germane cognitive loads. Intrinsic load relates to the inherent difficulty of a task or idea. Extrinsic load relates to the effect of extraneous, outside influences that can occur during knowledge acquisition and is often associated with the interference imposed by the learning environment

Germane load refers to the degree of effort involved in processing new information or learning concepts and is modified by how motivated or interested the learner is towards the subject matter and/or presentation method(s), as postulated by earlier educational theorists such as Keller and Weiner [12]

[14] [32]. Our premise is that if serious games can reduce the intrinsic, extrinsic or germane load, they should increase the efficacy of the learning. One final point about immersing content must be made. While engagement and immersion may reduce extrinsic load in that the player-learner is less distracted by events occurring outside the game environment, care must be taken in the design of the game to avoid adding too many highly arousing elements that end up increasing the extrinsic load of the pedagogic goals because the player-learner is distracted from the lesson within the game.

D. Providing support for practice and relearning

Cognitive load is also reduced at the moment a learner begins to internalize the content and is able to utilize it in an automatic way. This concept of automasticity refers to the ability to perform a cognitive activity (e.g., retrieving meaning for words, multiplication tables, driving a car, etc) in an automatic fashion. As opposed to controlled processes that require some part of a learner's limited attentional capacities, researchers have suggested that automated cognitive processes require less attentional capacity and permit the allocation of a portion of the brain to be allocated to higher-order tasks [34] [35]. Bloom referred to this in his taxonomy of psychomotor skills as 'naturalization' [36].

A game intended to teach a skill, be it in the cognitive or psychomotor domain, needs to include in its design (and, therefore, by definition, in its fantasy context) in a seamless fashion to promote this automasticity or naturalization. If the content is immersed properly, the concept of 'leveling-up' takes on a new meaning. Most successful games promote increased skill development through the different levels within the game. But most game designs center around increasing gameplay skills rather than content knowledge.

The design team can ensure content knowledge is what is 'leveled up' by determining whether cognitive load is reduced when playing games (i.e., is there less external load placed on player-learner in a game playing atmosphere), and if playing the game helps to reduce internal load because basic cognitive processes are being aided in some way by the game. To answer these questions, a measurement process needs to be developed during testing to ensure that player-learners are encouraged to replay the game at increasingly higher levels and are required to transfer previously acquired knowledge to new and unique situations. Skill development and/or knowledge internalization happens when that information is required to be used repeatedly to the point that it becomes a part of one's natural thought process.

IV. Discussion

Perhaps the best way to fully understand the nuances described in this article may be to offer a couple of examples. Hundreds, perhaps thousands of MMORPGs can be found on the Web. One should agree that most of them are quite useful in teaching something, even if, as Gee claims, only social learning skills [9]. We looked at two games that seem to enjoy considerable success and popularity. The first is *Eve-Online*, a game that its producers claim has almost 200,000 subscribers. The second is *World of Warcraft*, an equally successful game in terms of the number of players it has attracted. Both games employ many of those fundamentals outlined as being crucial to learning, even though neither makes any claims to have been developed for educational purposes. As non-educational games, neither utilizes specific curricular content in their level design. Of the two, however, *World of Warcraft* seems to be better at fostering 'leveling up', now offering over 70 different player levels. In addition, players can assume more than one avatar, giving them multiple playing contexts. This game also provides a well-designed party system in which multiple players can work cooperatively to create a unique, balanced team (each member contributing a characteristic deemed necessary to winning their battles). This means that the game presents considerable motivating opportunities for extended play well beyond what would be necessary for educational purposes. Players generally stay on task and reuse gameplay knowledge and choices almost infinitely to the point where automasticity on the part of its players is almost a given as they increase their skill levels.

The attraction in Eve Online is the complexity of the virtual world it has built, kind of like an extra-terrestrial version of 'Sims City' series. While there certainly are similarities and several differences in intent and concept, the game carries a strong content requirement for players to progress (in this case grow economically). Reviewers describe the gameplay in terms of the extensive financial and monetary factors it introduces that parallel content being taught in macro economics class at many universities. Anecdotally, players have been known to claim that what they learned from playing this game has actually helped them succeed in their college economics classes. What the game misses by not being designed for a specific curriculum is goal-specific learning materials (content relevance), its ability to encourage players to transfer their newly gained knowledge to other contexts, and the number of levels as what is found in *World of Warcraft* so that naturalization of content is assured.

While both games have their strong points, neither can be considered educational per se nor do their producers claim them to be, however they do have their strong points. The point is that, hypothetically, they could well become self-contained, effective educational or serious games with some bit of re-engineering by combining the strengths found in each of them: adding a content focus to the *World of Warcraft* and/or a more sophisticated level design to *Eve Online*.

V. Summary and Conclusions

Online games appear to be the fastest growing segment in the game industry and play an important role as an informal learning and socialization tool for today's youth. The ubiquity and ever-increasing relevance of virtual worlds in their lives has created an environment in which learning or 'schooling' is no longer place-related but a frame of mind. The authors suggest that games, especially MMORPGs, can become a seminal learning tool for those who regularly operate in virtual contexts because online games provide a compelling and engaging interactive context which is very familiar to these potential player-learners. To date, most of the positive

standing as an educational tool games have enjoyed has been based on their power to motivate and to change attitudes of those who play them. If online games are to reach their potential to become an effective instructional channel, developers and educators must work together to build into the game designs those elements considered by both parties to be best practices in their respective domains.

The authors propose that if educational games, regardless of their delivery system, are to sustain the acquisition of facts and concepts, they must be developed to also foster a transformation of this explicit knowledge into implicit understanding, analysis, and/or synthesis that has been long held as a decisive factor in the quality and duration of the desired learning content. In short, educational games must be based on the same best practice factors as any other effective instructional activity, which has long been fostered in educational theory.

While such a comparative analysis of prospective elements is made difficult because of confusion of terminology between game developers and educational technologist and a false sense on the part of the former that all games by their nature teach, the authors have been able to identify what they believe are three key design principles that they deem are shaped by common design theories and practices. First, the games must present the desired content in such a way that is relevant to the player-learners, their needs, and previously introduced content. Second, the context and design must be engaging in such a way as to foster continued play, a proposition few will argue against. More importantly, the game must simultaneously fully engage the player-learners in an interactive manner, and also immerse the desired learning content in the fantasy context of the game. In other words, we contend that creating an engaging atmosphere is a necessary but insufficient condition to learning. We also suggest that a well-developed educational game that simultaneously and fully immerses the learner into the content and the learning into the fantasy context very closely parallels a constructivist approach to learning in which the learner becomes actively engaged in the construction of his or her own learning and creates an effective and authentic virtual classroom environment.

Third, we believe that the game's gameplay context, fantasy, and level design must all focus on skill transfer in terms of the desired learning content in such a way that it is hierarchically and repeatedly utilized within the game in such a way that it parallels Bloom's taxonomic views on knowledge acquisition. The end result should be content that is analyzed and synthesized, and re-applied in new contexts and is reused to the extent that the player-learner is able to recall the newly acquired information in an automatic manner so that it, in turn, can be used as the basis for new learning and/or higher order thinking skills.

Massively multiplayer online role playing games are well-positioned to become a lynchpin for educators and would be perfect to revolutionize online learning. Like all games, they need to incorporate those qualities that are known to produce effective results. The conundrum faced by game developers is that, while these qualities will result in effective learning situations, they also can cause potential leveraging issues for game development companies. A game that correctly immerses academic content, for example, may not be easily used in multiple circumstances without considerable programming changes. This may explain why, to date, very few games exist that follow these precepts. Until companies find a way to follow them in economically feasible way, we need to be aware of the fact that, perhaps, MMORPGs may never realize their full potential.

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